

introducing the program partially in recognition of the "importance" of The Great American Smoke Out, "especially as it occurs during Child Safety and Protection Month."

According to the ALA, in its pamphlet titled *Facts About Second-Hand Smoke*, "numerous studies involving children ages five to nine showed impaired lung function in those who had smoking parents as compared to those whose parents were nonsmokers." See *Businesswire*, November 10, 1993.

### [33] Denver Health and Hospitals Takes First Step to Smoke-Free Campus

In an initial effort to make its campus smoke-free, Denver Health and Hospitals will restrict smoking to a new building on its main campus. The building will be located centrally on the campus, and visitors, patients and department employees who wish to smoke will be directed to the building. DHH has not yet set a date for installation of the building. Denver public health director, Frank Judson, M.D. reported that the building will be temporary and is the first step toward the ultimate goal of having a smoke-free campus. See *Modern Healthcare*, October 25, 1993.

## SCIENTIFIC/TECHNICAL ITEMS

### UPCOMING SCIENTIFIC MEETINGS

#### [34] The National Environmental Tobacco Smoke Conference: "Public Battles, Private Choices," IAQ Publications, Inc., Washington, D.C., December 16-17, 1993

Billed as "the year's premiere national gathering," this conference is scheduled to include speakers from law, government, occupational safety and health, building management, and public interest groups who are "spearheading the national response" to ETS, according to conference organizers, IAQ Publications, Inc., publishers of *Indoor Air Review*.

The first scheduled session at the conference is "EPA/OSHA/CDC: Overview and Analysis of ETS Programs, Policy, and Activities." Referring to EPA's recent Risk Assessment on ETS, the description of this session states that "senior agency officials" will discuss

"what lies in store for the public in the areas of regulation, enforcement and research." Individuals scheduled to speak include Bob Axelrad, Director of EPA's Indoor Air Division, and Michael Eriksen, Director of the CDC's Office on Smoking and Health. An OSHA participant, if any, was not identified in the conference announcement.

Three sessions will be devoted to overviews of state and federal ETS legislation. The descriptions of the sessions on House and Senate activities imply that some action will be forthcoming, e.g., "some observers say it's only a matter of time before the federal government punctuates the smoking debate by mandating restrictions on smoking in public places." Peter Grannis, a New York State Assemblyman, is listed as a speaker.

A session on public interest and private sector initiatives is introduced in the program by the sentence: "Public awareness of the alleged health hazards of ETS has never been higher." The description also alludes to ASH's petition for an emergency temporary standard from OSHA. John Banzhaf, Executive Director of ASH, Scott Ballin, Vice President of the American Heart Association, Fran DuMelle, Deputy Managing Director of the American Lung Association, and Ed Sweda, an attorney for the Group Against Smoke Pollution (GASP), are listed as speakers, presumably for this session.

Two sessions are devoted to "ETS Management and Liability" in the workplace and in the restaurant and hospitality industries. The program alleges that workplace smoking "has become the management hot potato of the 1990s," and that for restaurants and hotels to take no action "opens the way for legal nightmares." Smoking policy options, and "how to avoid costly and debilitating lawsuits" are scheduled to be discussed. Speakers listed who could potentially contribute to these discussions include Bill Borwegen, Director of Occupational Health and Safety for the Service Employees International Union, James Dinegar, Vice President of Government and Industry Affairs of the Building Owners and Managers Association and Bob Harrington, Director of Technical Services for the National Restaurant Association.

Several scheduled speakers have legal backgrounds: Laurence Kirsch, of the Washington, D.C., firm Cadwalader, Wickersham & Taft; Susan Rosmarin, of the New York firm Thelen, Marin, Johnson & Bridges;

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and Victor Schwartz, of Crowell & Moring in Washington, D.C. ETS litigation is the focus of two conference sessions, one on "precedents and predictions," and the other on plaintiff and defense theories. The program suggests that ETS litigation will turn from a "slow but steady stream" into a "torrential flow," creating "massive litigation problems" for the tobacco industry. Strategies for "pursuing legal action" on ETS issues, for preventing or defending ETS lawsuits, and using legal means for "preventing ETS problems" may also be discussed.

[35] **Annual Meeting, Society for Risk Analysis,  
Savannah, Georgia, December 5-8, 1993**

At its 1993 Annual Meeting, the Society for Risk Analysis is scheduled to address topics in the areas of risk assessment, risk communication, regulatory policy, risk characterization, exposure assessment, and dose-response issues. Some of the specific areas to be covered during the meeting's sessions include risk perception as a basis for communication, the use of biological markers in dose-response assessment, EMF risk communication and management, the "worth" of science in regulatory decisions, consumer product risk assessment, and risk characterization of air pollutants.

[36] **Liability, Compliance, Insurance and Indoor Air  
Quality, MidAtlantic Environmental Hygiene  
Resource Center, Philadelphia, Pennsylvania,  
December 9, 1993**

According to an announcement for this course, there is a "potentially broad scope of liability for problems with indoor air quality." Course topics include workers' compensation claims, codes and standards, IAQ insurance, current IAQ bills in Congress, scientific evidence and IAQ litigation, the ADA, and multiple chemical sensitivities.

[37] **One Day Overview of Indoor Air Quality,  
MidAtlantic Environmental Hygiene Resource  
Center, Philadelphia, Pennsylvania, December  
10, 1993**

This introductory course is designed for "people who are new to indoor air quality," such as human resources personnel, occupational safety and health officers, and

risk managers, according to the course announcement. Topics to be covered range from defining "good" IAQ to health effects, productivity, sources of contaminants, HVAC system impact, IAQ investigations, and remediation strategies. The outline for the course also includes "Implications of recent findings on environmental ('second hand') tobacco smoke."

[38] **9th World Conference on Tobacco and Health,  
Paris, France, October 10-14, 1994**

This conference, which focuses on smoking cessation and bans, is scheduled to include a round table discussion on ETS, organized by Rodolfo Saracci. Topics for discussion include the purported health effects of ETS exposure, European legislation to "protect" nonsmokers, and economic implications of controlling smoking in public places.

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## LUNG CANCER

[39] **"Risk Factors for Lung Cancer in Non-Smokers  
in Xuanwei County of China," Q. Lan, W.  
Chen, H. Chen, and X.-Z. He, *Biomedical and  
Environmental Sciences* 6: 112-118, 1993 [See  
Appendix A]**

This paper reports on a relatively small case-control study of nonsmoking women from a region that has the highest annual lung cancer death rates in China. Previous work in this locality has investigated the use of "smoky" coal for heating and cooking as a risk factor for lung cancer. In this study, the authors assess "passive smoking," although specific information about the definition of exposure is lacking. The authors report an adjusted odds ratio of 1.15 (95 percent CI 0.43-21.82), which is not statistically significant. The authors also report that smoky coal use was associated with an increased risk of lung cancer, and suggest that the use of rapeseed oil, personal history of chronic bronchitis, family history of lung cancer, short menstrual cycle, and late menopause "may also contribute to the risk of lung cancer." This study brings the number of epidemiologic studies on ETS exposure and lung cancer to approximately 35.

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## RESPIRATORY DISEASES AND CONDITIONS – ADULTS

- [40] "Passive Cigarette Smoke, Coal Heating, and Respiratory Symptoms of Nonsmoking Women in China," C.A. Pope and X. Xu, *Environmental Health Perspectives* 101(4): 314-315, 1993 [See Appendix A]

Anhui Province in China is the site of this study of a cohort of never smoking women. The authors report that respiratory symptom prevalence was increased for women living in homes with both coal heating and resident smokers. While they claim to show a "pronounced and statistically significant" effect for ETS and coal heating together, the authors state that the association for ETS alone was "relatively weak."

- [41] "The Prevalence of Inherited and Environmental Factors in Patients with Bronchial Asthma," S. Sreenan, R. Lyons, S. Pathamakanthan, C.K. Power, and C.M. Burke, *Chest* 104(2, Suppl.): 61S, 1993 [See Appendix A]

In this abstract, presented at a meeting of the American College of Chest Physicians in October 1993, the authors report that, in a group of subjects from Dublin, Ireland, parental smoking during childhood was statistically significantly associated with "ever having wheeze." Sibling history of asthma was reportedly statistically significantly associated with risk of asthma, and a personal history of allergy was reportedly associated with wheeze.

report a statistically significant association between maternal smoking and childhood asthma.

- [43] "Effects of Acute Passive Smoking on Exercise-Induced Bronchoconstriction in Asthmatic Children," H. Magnussen, B. Lehnigk, M. Oldigs, and R. Jorres, *Journal of Applied Physiology* 75(2): 553-558, 1993 [See Appendix A]

Thirteen asthmatic children were experimentally exposed to ETS in an exposure chamber in this study conducted by German researchers. The authors report that ETS exposure was related to a decrement in lung function, particularly in "smoke-sensitive" children. However, the decrement was reportedly not greater following exercise.

- [44] "Effects of Air Pollution on the Respiratory Tract of Children," R. Schmitzberger, K. Rhomberg, R. Puchegger, D. Schmitzberger-Natzmer, G. Kemmler, and B. Panosch, *Pediatric Pulmonology* 15: 68-74, 1993 [See Appendix A]

These Austrian researchers report that decrements in lung function were associated with living in areas with elevated levels of airborne pollutants. In addition, the authors examined parental smoking, and report an increased risk of childhood asthma and pulmonary function deficits. They note, however, that "[i]n more polluted areas, there was no additional effect of passive smoking."

## RESPIRATORY DISEASES AND CONDITIONS – CHILDREN

- [42] "The Associations Between Childhood Asthma and Atopy, and Parental Asthma, Hay Fever and Smoking," M.A. Jenkins, J.L. Hopper, L.B. Flander, J.B. Carlin, and G.G. Giles, *Paediatric and Perinatal Epidemiology* 7: 67-76, 1993 [See Appendix A]

The authors of this study examine data collected 25 years ago on potential risk factors for asthma among Tasmanian children. They report that a history of hay fever, eczema, hives, or certain allergies was associated with a higher prevalence of asthma. The authors also

## OTHER HEALTH ISSUES

- [45] Letters to the Editor Regarding "Relationship of Sudden Infant Death Syndrome to Maternal Smoking During and After Pregnancy," K.C. Schoendorf and J.L. Kiely, *Pediatrics* 90(6): 905-908, 1993

*Pediatrics* recently published three letters concerning the Schoendorf and Kiely study, which was discussed in issue 37 of this Report. The original study claimed to present data showing that smoking during pregnancy and infant ETS exposure were associated with an increased risk of SIDS. The authors of the letters were Marc Bulterys and Peter N. Lee. A reply by the authors

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of the original study was also published. The letters appear at *Pediatrics* 92(3): 505-506, 1993.

Bulterys' brief letter comments that the Schoendorf and Kiely study "strongly supports" the "notion" that maternal smoking is the "single most important preventable risk factor" for SIDS, and suggests that "passive tobacco smoking" after birth may also show an association. He goes on to propose that a "critical period" for maternal smoking might be the early weeks of pregnancy, noting that women who quit often do so only after learning that they are pregnant.

Lee writes that Schoendorf and Kiely's "commendable" attempt to separate smoking during and after pregnancy in their analysis contains "certain problems." For example, he suggests that maternal smoking habits could have changed following the stress of an infant's death. Lee comments that the study did not include a statistical analysis that would examine the possibility of an independent association with smoking during pregnancy after adjustment for smoking after pregnancy. Lee also suggests that uncontrolled confounders could affect the reported association, noting that Schoendorf and Kiely only considered marital status, maternal age, and maternal education in their analyses.

In their reply, Schoendorf and Kiely comment that a single study cannot conclusively demonstrate causality, and state that other studies confirming their reported results are necessary. They indicate that they do not have sufficient data to investigate Bulterys' hypothesis, and defend their choice of potential confounders for inclusion. Schoendorf and Kiely, while stating that further studies with more detailed smoking information are needed, state that "the increased risk of SIDS in the passive exposure group is large enough to warrant concern and consideration."

#### ETS EXPOSURE AND MONITORING

- [46] "A Tobacco-Specific Lung Carcinogen in the Urine of Men Exposed to Cigarette Smoke," S.S. Hecht, S.G. Carmella, S.E. Murphy, S. Akerkar, K.D. Brunnemann, and D. Hoffmann, *New England Journal of Medicine* 329(21): 1543-1546, 1993 [See Appendix A]

NNK, a substance reported to experimentally induce lung adenocarcinomas in animals, is reportedly found in

tobacco smoke. In this study, urine samples from nonsmokers experimentally exposed to high concentrations of sidestream smoke were examined for the presence of NNK and its metabolites. The authors claim that the presence of these substances in their study participants supports the EPA's claim that ETS exposure is causally associated with nonsmoker lung cancer.

- [47] "Preliminary Assessment of Designated Smoking Areas for Nonsmoker Exposure to Environmental Tobacco Smoke," E.N. Light and R. Gay, presented at Indoor Air Quality '93: Operating and Maintaining Buildings for Health, Comfort and Productivity, ASHRAE, Philadelphia, Pennsylvania, November 7-10, 1993 [See Appendix A]

The authors of this study report that, in two buildings with a variety of areas designated for smoking, separately exhausted smoking lounges were "effectively isolated from nonsmokers." Moreover, they report that indicators of ETS were below the limits of detection in areas receiving recirculated air from smoking areas and distant from active smoking.

- [48] "Mainstream and Sidestream Cigarette Smoke-Induced DNA Adducts in C7B1 and DBA Mice," C.G. Gairola, H. Wu, R.C. Gupta, and J.N. Diana, *Environmental Health Perspectives* 99: 253-255, 1993 [See Appendix A]

Based on exposure studies using two strains of mice, the authors of this study conclude that mainstream and sidestream cigarette smoke exposure did not induce new DNA lesions, but enhanced existing DNA adducts.

#### SMOKING POLICIES AND RELATED ISSUES

- [49] "Smoking Control in Restaurants: The Effectiveness of Self-Regulation in Australia," M.J. Schofield, R. Considine, C.A. Boyle, and R. Sanson-Fisher, *American Journal of Public Health* 83(9): 1284-1288, 1993 [See Appendix A]

The authors of this study claim that the restaurant industry's policy of allowing member restaurateurs to make their own decisions concerning smoking policies is not effective and does not satisfy customers' wishes.

## STATISTICS AND RISK ASSESSMENT

- [50] "Data Torturing," J.L. Mills, *New England Journal of Medicine* 329(16): 1196-1199, 1993  
[See Appendix A]

In this commentary, the author describes "data torturing," which he describes as either finding a statistically significant association in the course of multiple comparisons and then generating a hypothesis to explain it, or manipulating data to fit a desired hypothesis, often via selective reporting.

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IN EUROPE &  
AROUND THE WORLD

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REGULATORY AND LEGISLATIVE  
MATTERS

## COUNCIL OF EUROPEAN COMMUNITIES (EC)

- [51] EC Council Proposes Addressing Smoking in  
Safety and Health Directive

On October 30, 1993, the EC Council published an amended safety and health directive proposal which, among other matters, includes a provision that would require smoking to be banned in workplaces that are on board means of transport if separate, enclosed areas for smokers and nonsmokers were not available. Specifically, the proposed amendment states: "Appropriate measures must be taken for the protection of workers who are non-smokers against discomfort and health risks caused by tobacco smoke through the provision of separate enclosed areas for smokers and non-smokers. Where this provision is not possible or available smoking must be prohibited." This language is intended to be appended to a section on ventilation in enclosed workplaces on means of transport.

The proposed directive also contains a provision stating, "In rest rooms and rest areas appropriate measures must be introduced for the protection of non-smokers against discomfort caused by tobacco smoke." A proposed amendment relating to smoking in living quarters on means of transport would add a reference to "health risks" and would require "the provision of separate enclosed areas for smokers and non-smokers."

## FRANCE

- [52] One Year Anniversary of France Antismoking  
Legislation

After one year, France's legislation to limit smoking in public places reportedly has "yielded uncertain results." One visible change is that tobacco consumption has declined 2.8 percent since January, apparently in partial response to a steady increase in cigarette prices in France.

The legislation, which took effect on November 1, 1992, banned smoking in train stations, Metro corridors, banks and schools, and it required cafes, restaurants and employers to designate areas for nonsmokers. Smokers who choose to disobey the law are fined; however, the ministries of labor, health, justice and the interior are unable to provide any statistics on either the number of violations or the number of prosecutions. A survey by the Centre for Tobacco Documentation and Information suggests that 71 percent of French citizens feel that smokers and nonsmokers should settle disputes among themselves. This is consistent with the attitude of some French who believe that many smokers in France are not lighting up in public places out of common courtesy to nonsmokers rather than a respect of the law itself. See *Agence France Presse* and *Associated Press*, October 31, 1993.

## SWEDEN

- [53] Swedish Campaign Discourages Smoking at  
Work

Several Swedish institutions, including the Cancer Fund, reportedly plan to introduce a nationwide campaign with the motto "no smoking at work." The campaign's goal is to encourage employers to take measures that will reduce the exposure of nonsmokers to ETS in the workplace, according to a news report. The campaign reportedly is based on the proposed new Swedish tobacco law and the European Community's programme against cancer. See *Arbetsarkydd*, October 13, 1993.

## LEGAL ISSUES AND DEVELOPMENTS

### WORLD HEALTH ORGANIZATION (WHO)

- [54] *Who Benefits from WHO?*, R.D. Tollison & R.E. Wagner, Research Report 18 (Social Affairs Unit, 1993)

The authors of this publication criticize WHO for spending more money on such matters as antismoking campaigns, seat belts and issues like "psycho-social health" than on combatting serious Third World diseases like malaria and cholera. The publication is replete with WHO budgetary data, which the authors suggest, show that WHO is unnecessarily concerned with personal choice issues that are of significance only to First World nations.

With regard to ETS, the authors observe, "Even issues surrounding environmental tobacco smoke do not involve external costs, and rather are matters of property rights. In a world of private property and free association, people are not forced to inhale other people's smoke. Rather they choose to expose themselves to that smoke because of other advantages they secure from the particular relationship at issue."

## OTHER DEVELOPMENTS

### ASIA

- [55] "Fired-Up Officials Won't Find Smoke-Filled Rooms At APEC," *The Seattle Times*, November 6, 1993

This article notes that Asian visitors to the Asia-Pacific Economic Cooperation forum to be held in Seattle, Washington may encounter smoking restricted in the U.S. The visitors will also be able to witness the annual Great American Smokeout on November 18th and the "publicity blitz" of Project ASSIST, a smoking cessation program sponsored by the American Cancer Society and the National Cancer Institute.

Some reportedly worry that the Asians may find smoking restrictions "inhospitable." Because of this, smoking will be allowed at the APEC events held at the Westin Hotel, and smoking areas are also available in

the hotel's three eateries. However, 80 percent of the Westin's individual rooms are smoke free and will supposedly stay that way. Smoking will also be allowed at the convention center's 102,000 square-foot international press center, although it may be restricted to a 17,000 square-foot smoking lounge.

### NORWAY

- [56] Lillehammer Organizers Sign "Smokefree Games" Deal

Organizers of the 1994 Winter Olympics have signed a "Smokefree Games" agreement with the World Health Organization (WHO), stating that their restrictions on smoking will be stricter than similar efforts at the 1992 Games in Barcelona and Albertville, and the 1988 Calgary Olympics. Each ticket for the 1994 Games will carry a message against smoking, and loudspeakers will broadcast antismoking messages. No tobacco will be sold at the sports arenas, and smoking will be banned at all indoor events. In addition, organizers are also making 80,000 lapel pins for children that are inscribed "Smokefree Olympics." Organizers are also urging the national rail firm to make all train rides from Oslo to Lillehammer, a two-hour ride, nonsmoking. See *Reuters*, November 8, 1993.

### SINGAPORE

- [57] Employee Complaints of Sick Building Syndrome May Be a Result of Stress or Other Personal Factors

An Environment Ministry paper presented at a recent conference suggests that personal factors, such as work stress, were more likely the problem than a "sick building" in six air-conditioned office buildings. While the buildings had not received any complaints prior to the study, 17 percent of the employees complained of dry throat, lethargy and stuffy noses on the questionnaires administered during the study. Dr. Goh Kee Tai, who presented the study at a Singapore ASHRAE conference, suggested that if the complaints are less than 20 percent, the building is considered "healthy."

Dr. Goh said the ministry is moving to the second phase of the study, in which 40 to 50 commercial buildings will be studied over a two-year period. Goh

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stated that the results of the study will be used to develop guidelines on IAQ for office buildings. See *The Straits Times*, November 3, 1993.

## UNITED NATIONS

### [58] United Nations Resolves To Go Tobacco-Free

At a recent meeting of the World Health Assembly in the UN Palais des Nations in Geneva, numerous countries co-sponsored a resolution to ban the sale and use of tobacco products in buildings owned, operated, or controlled by the UN system. While no country apparently spoke out against the resolution at the meeting, several tobacco producers reportedly urged the WHO to step up its efforts to work with the Food and Agricultural Organization on crop substitution. United States, Australia, Canada, China, Finland, France, Hungary, Iceland, Ireland, New Zealand, Norway, and the United Kingdom were among the countries cosponsoring the resolution. Implementation of the ban is scheduled for May of 1995. See *Tobacco Control* 2: 248-50, 1993.

surveyed had comprehensive tobacco-free policies such as the Canadian Navy, according to the article.

## UNITED KINGDOM

### [60] "Millions Lost If Smoking Ban is Introduced," *Morning Advertiser*, November 8, 1993

This article announces that the *Morning Advertiser* is joining forces with the Freedom Organisation for the Right to Enjoy Smoking Tobacco (FOREST) to find out what British publicans think about the smoking debate and how any form of restriction could affect their trade. A FOREST spokesperson suggests that pub owners that forcing them to prohibit smoking would damage their businesses. Presently, it is the decision of each individual publican whether smoking is allowed in his or her own pub. The article states that the government appears to be "in no rush" to introduce antismoking legislation but that lawmakers "could issue directives long before the turn of the century."

## MEDIA COVERAGE

### CANADA

### [59] "Canadian Navy Butts Out," *Tobacco Control* 2(3): 191, 1993

A new Canadian policy objective will restrict smoking to designated outdoor areas of ships, according to this article. As discussed, a single interior designated smoking area may be allowed if it meets the following requirements: (i) it does not violate the policy restrictions; (ii) it is separately ventilated; and (iii) it is not used by nonsmokers. Effective September 1, 1993, the sale of tobacco products was reported to be eliminated in all shore facilities under the jurisdiction of the Navy, as well as on ships in port. The article notes that the sale of all tobacco products will be eliminated as of January 1, 1994.

A survey of smoking policies among the world's naval forces conducted by Physicians for a Smoke-Free Canada has indicated that none of the countries

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## APPENDIX A

The numbers assigned to the following article summaries correspond with the numbers assigned to the synopses of the articles in the text of this Report.

### LUNG CANCER

- [39] "Risk Factors for Lung Cancer in Non-Smokers in Xuanwei County of China," Q. Lan, W. Chen, H. Chen, and X.-Z. He, *Biomedical and Environmental Sciences* 6: 112-118, 1993

"The population-based case-control study presented here is to evaluate the influence of factors on the occurrence of lung cancer in non-smoking women in Xuanwei County and to supplement the etiologic factors of lung cancer in Xuanwei County."

"The study population was confined to female farmers, in order to control the effect of occupational and smoking factors."

"The crude and adjusted ORs for having or not ever used smoky-coal from 'Laibin' smoky coal mine and average amount of use of smoky coal from 'Laibin' smoky coal mine per year with 95% confidence interval are shown. Significant association of these two factors with lung cancer are [sic] observed. A significant dose-response relationship of lung cancer with the average amount of smoky coal used per year was also observed."

"Besides animal oil, rapeseed oil was the oil often used by Xuanwei residents....[A]lthough no significant association with lung cancer was observed for ORa [adjusted] of often use of rapeseed oil, it showed a higher odds ratio. ORa is 4.58 (95% CI 0.56-37.08). No statistically significant association with lung cancer for passive smoking was found [Adjusted OR 1.15, 95% CI 0.43-21.82]."

"Odds ratios for personal history of chronic bronchitis was [sic] found to be significantly associated with lung cancer. Although there was no significant association with lung cancer, the ORa for family history of lung cancer was high."

"Our study showed that the use of smoky coal from 'Laibin' smoky-coal mine greatly increased the risk of development of lung cancer, especially the lifetime use

of smoky coal from 'Laibin' smoky-coal mine (ORa = 9.89, 95% CI = 3.95-24.75). The risk of lung cancer also increased with the increasing of the average amount of using smoky coal per year. Exposure to smoky coal from 'Laibin' smoky-coal mine before age 20 also showed a high risk of lung cancer (ORa = 5.10, 95% CI 0.97-26.81)."

"It seems unlikely that the menstrual pattern of Xuanwei women contributes greatly to their high lung cancer risk, but the internal consistency of trends suggested that future studies of lung cancer in China and elsewhere should examine endocrine hypotheses in more details."

"In summary, this population-based case-control study of lung cancer in rural area, Xuanwei County suggests that the use of smoky coal from 'Laibin' smoky-coal mine, which causes severe indoor air pollution, may be related to the lung cancer in Xuanwei females. Other factors, such as the use of rapeseed oil, personal history of chronic bronchitis, family history of lung cancer, short menstrual cycle and late menopause, may also contribute to the risk of lung cancer."

"At present, a cohort study to confirm the relationship between the indoor air pollution from 'smoky' coal burning and lung cancer in Xuanwei County is being conducted by the present investigators."

### RESPIRATORY DISEASES AND CONDITIONS — ADULTS

- [40] "Passive Cigarette Smoke, Coal Heating, and Respiratory Symptoms of Nonsmoking Women in China," C.A. Pope and X. Xu, *Environmental Health Perspectives* 101(4): 314-315, 1993

"In the present study, we used data from a sample of never-smoking women in China to evaluate the combined effects of in-home air pollution from passive cigarette smoke and coal heating on reported prevalence of respiratory symptoms."

"To assure a relatively young, nonsmoking, educated cohort, we used a subset of 973 of these women for this analysis. This subset included only women who 1) were 20-40 years of age, 2) had never smoked, and 3)

had at least a middle or high school education. Thirty-five percent of the women lived in homes that were heated with coal stoves. All of the women worked in one of three textile mills in Anhui, China."

"Five respiratory symptoms were defined based on yes/no responses to the symptoms questions in the questionnaire. 'Chest illness' was defined as chest illness with increased cough or phlegm during the last 3 years; 'cough' was defined as usually coughing in the morning or usually coughing during the day or night; 'phlegm' was defined as usually bringing up any phlegm from the chest first thing in the morning or during day or night; 'shortness of breath' (SOB) was defined as shortness of breath when walking with a person the same age at their own pace on level ground; and 'wheeze' was defined as wheezing or whistling from the chest."

"The prevalence of chest illness, cough, phlegm, and SOB were generally higher for women living in homes with both coal heating and smokers. Effects of passive smoking were more pronounced in homes with coal heating than in homes without coal heating. The prevalence of chest illness, cough, phlegm, and SOB were approximately 2.4, 2.1, 2.8, and 2.2 times higher, respectively, for women in homes with both coal heating and more than one smoker than for women in homes without coal heating and with no smokers. Although the prevalence of wheeze was not positively associated with passive cigarette smoke, it was positively associated with coal heating."

"[I]n this study, when evaluated separately from coal heating, the association between passive cigarette smoking and respiratory symptoms was relatively weak. However, the combined effect of both passive cigarette smoke and coal heating was pronounced and statistically significant."

"In this study, the likelihood that observed associations between respiratory symptoms and passive cigarette smoke and coal heating were due to unknown or uncontrolled confounding factors is reduced because a relatively homogeneous cohort of women were studied....Significant differences in prevalence of respiratory symptoms were observed between women who worked in administrative areas at the textile mill versus those who worked in manufacturing, suggesting differences in occupational exposures. Nevertheless, the association with in-home passive cigarette smoke and coal heating did not diminish after controlling for age,

mill, and type of duties at the mill (administrative or manufacturing)."

"A major implication of this study is that health effects of passive cigarette smoke need to be evaluated within the context of combined exposures to multiple sources of indoor air pollution. Effects of passive cigarette smoke and effects of coal heating were larger when the other indoor pollution source was present. In homes with no other major indoor air pollution source, health effects of passive cigarette smoke on adults may be relatively small. However, in many parts of the world where most homes are heated by unvented combustion, combined respiratory health effects may be substantial."

[41] "The Prevalence of Inherited and Environmental Factors in Patients with Bronchial Asthma," S. Sreenan, R. Lyons, S. Pathamakanthan, C.K. Power, and C.M. Burke, *Chest* 104(2, Suppl.): 61S, 1993

"We studied the association between hereditary and environmental factors and asthma. A total of 750 subjects from North County Dublin were randomly selected and surveyed by a trained interviewer and a respiratory questionnaire comprising over 76 questions was completed."

"[A]nalysis showed a significant association between sibling history of asthma and the symptoms of 'wheeze ever' and physician diagnosed asthma."

"Exposure to parental cigarette smoking during childhood was significantly associated with ever having wheeze (odds ratio 2.55, Confidence Interval 2.23-6.75)."

"Wheeze in the last year was also associated with ever having smoked and with current passive smoking."

"Persistent wheezers were also more likely to have had a history of allergy to pollen, house dust, animal furs and feathers. Wheeze in the last year was also associated with living in damp housing."

"A variety of environmental factors such as the use of coal fires paraffin heaters and gas cookers as well as the presence of carpets in houses were not associated with physician diagnosed asthma (PDA)."

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RESPIRATORY DISEASES AND  
CONDITIONS – CHILDREN

- [42] "The Associations Between Childhood Asthma and Atopy, and Parental Asthma, Hay Fever and Smoking," M.A. Jenkins, J.L. Hopper, L.B. Flander, J.B. Carlin, and G.G. Giles, *Paediatric and Perinatal Epidemiology* 7: 67-76, 1993

"Reported here is a descriptive multivariable analysis of the 1968 Tasmanian Asthma Survey of 7-year-old children born in 1961. The aim of this analysis was to examine the degree to which a history of asthma in a 7-year-old child can be associated statistically with atopic conditions of the child, and with parental asthma, hay fever and smoking. The size of the study (over 8500 children and their families) enables associations to be estimated with precision, and as nearly all eligible children in the population were surveyed (99%), estimates of associations are not subject to selection bias."

"Multivariable analysis of the 1968 Tasmanian Asthma Survey has found that the prevalence of asthma was higher in children who had a history of hay fever, eczema, or hives, or who had an allergy to foods or medicines. These atopic conditions were found to be independent risk factors, in that an increased risk of asthma was associated with each factor even though the increased risks associated with all other factors had been taken into consideration by the statistical model. The strengths of these atopic risk factors for asthma were independent of the sex of the child. Moreover, they were not substantially weakened by including information about the asthma status of the parents, which was strongly associated with the asthma status of the child."

"The crude OR between asthma in the mother and in the father was 1.7 (99% CI 1.30-2.21). This suggests that there may be non-genetic risk factors for asthma common to the parents, such as household asthma triggers including pets or dust mites. However this association may also be due to assortative mating or reporting bias due to selective recall of asthma history."

"Parental smoking was weakly associated with a child's asthma, reached statistical significance only when it was the mother who was the smoker and even then was not a strong predictor (OR 1.26). Other

studies have also found that maternal smoking, and not paternal smoking, was associated with the child's respiratory health. This may be due to children spending more time with their mother than with their father."

"These findings are consistent, not only with childhood asthma being strongly associated with atopy, but also with the existence of strong unmeasured determinants common to family members, the effects of which are not mediated via atopy. The magnitude of the observed familial associations indicate that these unmeasured determinants are strong determinants of asthma risk."

- [43] "Effects of Acute Passive Smoking on Exercise-Induced Bronchoconstriction in Asthmatic Children," H. Magnussen, B. Lehnigk, M. Oldigs, and R. Jorres, *Journal of Applied Physiology* 75(2): 553-558, 1993

"[W]e wondered whether ETS would induce an acute airway response if inhaled during increased ventilation brought about by exercise. Many children with bronchial asthma develop exercise-induced airway obstruction, even when breathing non-polluted air. We therefore compared, on an individual basis, the airway response to exercise during inhalation of ambient air and air polluted by ETS. In addition, we determined the airway response after our subjects breathed cold and clean air to estimate the maximum increase in response induced by ambient conditions."

"We investigated 13 children (8 boys, 5 girls) with bronchial asthma, ranging in age from 8 to 13 yr."

"From our previous study, we knew the type and severity of symptoms induced by ETS exposure. The subjects always complained of eye irritation, which was so severe that some were reluctant to participate. Therefore, in the present study, children wore goggles during all exposures, and we concentrated on assessment of the reproducibility of those symptoms indicating irritation of the upper and lower respiratory tract (nose and throat irritation, cough, chest tightness)."

"Our study demonstrates that, in children with bronchial asthma, short-term exposure to ETS may induce a fall in FEV<sub>1</sub> but does not modulate exercise-induced bronchoconstriction compared with ambient air."

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"In this investigation, we were unable to find significant differences between lung function data measured before and after exposure or changes in the airway responsiveness to inhaled histamine that was assessed after exposure. In the present study, lung function was measured during exposure at rest, and we found a significant drop in  $FEV_1$  as early as 5 min after starting exposure.  $FEV_1$  did not change further between 5 and 54 min of exposure at rest. Analysis of the individual response revealed that the mean fall in  $FEV_1$  during ETS compared with ambient air exposure was mainly based on three smoke-sensitive children who showed a more-than-average fall in  $FEV_1$ ."

"In our study, exposure at rest was followed by exercise under the same experimental conditions. It is of interest that the fall in  $FEV_1$  that was observed during exposure to ETS at rest disappeared immediately after exercise, demonstrating the transient character of lung function impairment."

"There was no correlation between the response to ETS at rest and during exercise.... These findings demonstrate the individual variability of the acute effects of passive smoking that cannot be predicted from history."

"We were unable to substantiate an adverse effect of passive smoking during exercise conditions on exercise-induced bronchoconstriction compared with exercise with ambient air."

"In summary, our study shows that, during ETS exposure,  $FEV_1$  can decrease in smoke-sensitive children with asthma. However, the fall in  $FEV_1$  is not intensified when ventilation rate is increased by exercise, and  $FEV_1$  does not differ between ETS and ambient air exposure after cessation of exposure.... Discomfort and irritation of the airways reported during acute passive smoking seem not to be linked with acute asthmatic airway obstruction. It is evident that the results of our study, which was restricted to acute effects of single short-term passive smoking, cannot be extrapolated to predict any effects of chronic passive smoking. For such repeated or long-term exposures, adverse effects have been demonstrated by many authors with respect to symptoms, lung function, and airway responsiveness in children with and without airway disease. Thus, every effort should be made to protect children from the hazardous effects of cigarette smoke."

- [44] "Effects of Air Pollution on the Respiratory Tract of Children," R. Schmitzberger, K. Rhomberg, R. Puchegger, D. Schmitzberger-Natzmer, G. Kemmler, and B. Panosch, *Pediatric Pulmonology* 15: 68-74, 1993

"This study in Austria was designed to determine the effects of air pollution on the respiratory tract of school children in three well-defined environments. Possible confounders such as environmental tobacco smoking (ETS) and socioeconomic status (SES), which may affect the association, were taken into account.... We tried to test the hypothesis of an association of lung disease and chronic air pollution, mainly by measuring the lung function."

"Mean values of pulmonary function tests in the three study zones are presented. All parameters were better in the least polluted Zone 2."

"Prevalence of asthma was increased in the more polluted zones; in the zone of elevated ozone it was highest."

"Passive smoking was assumed to be one of the important indoor air pollution factors. A significant correlation between passive smoke exposure and respiratory morbidity and decreased lung function was noted in the case of maternal smoking. Multiple logistic regression also confirmed the increased risk of asthma with a prevalence ratio of 2.07 if the child's mother was a smoker."

"Our data demonstrate a clear relationship between the impairment of air flow rate at mid- to low lung volumes and residence in areas with elevated levels of airborne pollutants ( $SO_2$ ,  $NO_2$ ,  $O_3$ )."

"the effects of exposure to parental smoking on children are particularly important. High frequency of respiratory infections and reduced pulmonary function related to ETS have been reported.... Our results showing reduced  $FEF_{50}$  and  $FEF_{75}$ , which might indicate damage of small airways, are consistent with the data reported.... Our findings of an increased risk of childhood asthma related to maternal smoking also correspond to other reports.... We did not find that the daily number of cigarettes consumed by the parents had an influence on lung function or symptoms in the children under investigation. In more polluted areas there was no additional effect of passive smoking.... In our study a positive association existed between higher

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SES and more frequent reports of respiratory symptoms and diseases."

"In conclusion, we have found a significant association between the exposure to air pollution and decrements in lung function in a large cross-sectional study. Self-reported prevalence of asthma was associated with air pollution. Although reports of other respiratory symptoms and respiratory diseases failed to show this pattern, the evidence that chronic exposure to airborne pollutants may result in decrements of lung function deserves serious consideration in the context of preventing airway diseases in adults."

### ETS EXPOSURE AND MONITORING

- [46] "A Tobacco-Specific Lung Carcinogen in the Urine of Men Exposed to Cigarette Smoke," S.S. Hecht, S.G. Carmella, S.E. Murphy, S. Akerkar, K.D. Brunnemann, and D. Hoffmann, *New England Journal of Medicine* 329(21): 1543-1546, 1993 [Appendix A]

"In this paper, we describe the presence of metabolites of a tobacco-specific lung carcinogen, 4-(methyl-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK), in the urine of nonsmokers exposed to sidestream cigarette smoke. Sidestream cigarette smoke is the smoke that originates from the smoldering end of a cigarette between puffs; it is the principal component of environmental tobacco smoke."

"In all men for whom data were available, excretion of the metabolites increased after exposure to sidestream smoke."

"In this study, we demonstrated the uptake and metabolism of NNK by nonsmokers exposed to sidestream cigarette smoke. The metabolites identified in urine were NNAL and its glucuronide. NNAL, like NNK, is a potent pulmonary carcinogen in rats and mice, inducing a high incidence of adenocarcinoma of the lung. Our demonstration that nonsmokers take up NNK thus provides support for the conclusion of the EPA that environmental tobacco smoke causes lung cancer in humans. It is notable that NNK and NNAL

induce primarily pulmonary adenocarcinomas, as occurs in nonsmokers exposed to environmental tobacco smoke."

"The ratio of NNAL and NNAL glucuronide to cotinine in urine was similar in passive smokers (1:4600) and active smokers (1:3900). The concentrations of nicotine and NNK in the sidestream smoke of a Kentucky 2R1 cigarette are about twice those in mainstream smoke."

"The exposure to sidestream smoke in this study was comparable to that which might be encountered in a heavily smoke-polluted bar, given the nicotine concentrations in our exposure room and those reported previously in bars (up to 119 ug per cubic meter). Most indoor environments would have lower concentrations of nicotine and NNK than those in our exposure room, and the concentrations of NNAL and its glucuronide in the urine of people in those environments would probably be lower than the concentrations reported here. Our results nevertheless establish the principle that NNK is taken up and metabolized by nonsmokers who are exposed to sidestream cigarette smoke, and they therefore provide evidence supporting the link between exposure to environmental tobacco smoke and the risk of lung cancer."

- [47] "Preliminary Assessment of Designated Smoking Areas for Nonsmoker Exposure to Environmental Tobacco Smoke," E.N. Light and R. Gay, presented at Indoor Air Quality '93: Operating and Maintaining Buildings for Health, Comfort and Productivity, ASHRAE, Philadelphia, Pennsylvania, November 7-10, 1993

"The authors were requested to perform a general assessment of ETS exposure by an organization that owned and fully occupied one office building (building A) and leased approximately half of another (building B). The survey was initiated to help the occupants answer the following questions:"

"Are smoking areas adequately contained?"

"What measures would improve the control of smoking areas?"

"What are the priorities for reducing exposure of nonsmokers?"

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"With mixing in the hallways and common return air shafts, recirculated air should be considered common throughout the building [A]."

"Return air would be considered common to each individual floor only with minimal mixing between floors [in building B]."

"Smoking was prohibited in the two buildings except where designated as follows:"

"Both buildings – private offices of non-union employees where union staff do not have to enter as part of their regular duties."

"Building A – one set of restrooms per floor on floors one through six, a smoking lounge on the seventh floor, and a portion of the cafeteria."

"Building B – one smoking lounge (second floor). Smoking was also permitted in other tenants' space (located on separate floors)."

"For each category of smoking area, representative sites were studied to identify potential pathways for ETS migration into nonsmoking areas and factors that would tend to create a worse-case exposure scenario. Next, smoking patterns and nonsmoking occupancy patterns were noted. The goal of the monitoring strategy was to qualitatively reflect both peak exposures (ETS level in locations immediately adjacent to active smoking) and background exposure (average conditions in areas not directly impacted by ETS)."

"ETS markers included two observations (ETS odor and visible haze) and three measurements (CO, nicotine, and particle counts)."

"Carbon monoxide (CO) measured in both buildings was always less than the detection limit of 2 parts per million (ppm). No visible haze was observed in non-smoking areas during the survey."

"In most cases, particle count results were not distinguishable from background."

"Both buildings potentially received recirculated ETS (following dilution and filtration) in all zones. In the areas monitored that were not immediately adjacent to smoking, no nicotine or ETS odor was detected. These limited findings suggest that the majority of areas frequented by nonsmokers within buildings A and B were reasonably well separated from designated smoking sites."

"Each building had one lounge constructed specifically for smoking and exhausted to the outside....Adjacent sites monitored indicated no detectable nicotine and no detectable ETS odor."

"Smoking is allowed in a small room connected by an open doorway to the main cafeteria dining area. The smoking room is not exhausted to the outside and was generally positive to the adjoining area. Monitoring over one lunch period in the nonsmoking area detected the highest level of nicotine during the survey along with consistent ETS odor."

"Within the sensitivity of the tests and observations performed, exposure was not documented from the recirculation of air even though many smoking areas were not exhausted to the outside. This suggests that there was little, if any, hazard under the conditions evaluated in areas potentially receiving recirculated ETS but not immediately adjacent to smoking."

"Positive pressurization of smoking rooms leading to intermittent nonsmoker exposure in immediately adjoining areas was the most common problem observed. Nonsmokers in common areas where smoking was allowed were assumed to be exposed to ETS. Generalizations about the effectiveness of smoking areas cannot be made from this limited survey. The failure to detect ETS indicators in recirculated air may have been a function of (1) the good ventilation rate in both buildings, (2) the dispersed smoking pattern, or (3) the sensitivity of the markers used. Under less favorable conditions, exposure from recirculated air may have been more significant."

[48] "Mainstream and Sidestream Cigarette Smoke-Induced DNA Adducts in C7B1 and DBA Mice," C.G. Gairola, H. Wu, R.C. Gupta, and J.N. Diana, *Environmental Health Perspectives* 99: 253-255, 1993

"The present study was conducted to compare the ability of mainstream and sidestream cigarette smoke to induce DNA adducts in the lung tissue of mice after chronic exposure."

"DNA adduct analyses showed that both types of cigarette smoke enhanced preexisting DNA adducts in mice lungs. The total DNA adduct levels in MS and SS groups of both mouse strains were several-fold higher than their respective room and sham-treated controls."

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While the adduct levels in SS groups of both strains were generally lower than the MS groups, the differences were not statistically significant....[I]t could be demonstrated that the adduct spots present in smoke-exposed mice lungs were also present in the control animals. These observations suggested that cigarette smoke exposures simply increased the magnitude of already existing adducts without inducing newer DNA lesions."

"The observations described above suggest that both sidestream and mainstream cigarette smoke are capable of enhancing preexisting DNA adducts in mice lungs. Therefore, the presence of enhanced DNA adducts in tissues may be used as a biomarker for either type of cigarette smoke exposure."

## SMOKING POLICIES AND RELATED ISSUES

[49] "Smoking Control in Restaurants: The Effectiveness of Self-Regulation in Australia," M.J. Schofield, R. Considine, C.A. Boyle, and R. Sanson-Fisher, *American Journal of Public Health* 83(9): 1284-1288, 1993

"Restaurants represent one public area where non-smokers are unwillingly exposed to environmental tobacco smoke, despite growing interest in encouraging restaurants to provide smoke-free areas."

"Despite strong arguments against smoking in restaurants, the means of creating smoke-free areas has been controversial....[T]he restaurant industry has actively opposed legislative action through lobbying groups such as Restaurants for a Sensible Voluntary Policy."

"This study had four aims:"

1. To examine restaurateurs' provision of smoke-free areas, their perception of their customers' desire for smokefree areas, and customers' actual preference for such areas."
2. To determine characteristics of restaurants and owners that predicted no-smoking policies."
3. To determine whether customer preference for no-smoking areas in restaurants differed by smoking status, sex, and age of customers."

"4. To examine restaurateurs' perception of barriers to the provision of smoke-free areas and their attitudes toward a legislative approach."

"The sample for the restaurateurs' survey consisted of 460 restaurants from two industrial nonmetropolitan cities in New South Wales, Australia."

"The self-regulation option, favored strongly by the restaurant industry, was examined to determine whether nonsmoking policies have been implemented in accord with the restaurateurs' perceived need for such policies. The findings highlighted a large discrepancy between owner-perceived need and actual implementation: only one third of owners who thought they should provide smoke-free areas actually provided such areas. It seems clear that self-regulation has not worked, as judged by the restaurant industry's own criterion of provision according to owners' perception of need."

"Restaurateurs greatly underestimated the proportion of customers who wanted smoke-free areas. Only 23.6% of all restaurants (26.1% of customer-surveyed restaurants) provided either separate areas or a total smoking ban, whereas nearly 90% of surveyed customers thought they should."

"How can such a discrepancy occur? One reason must lie in the failure of the public to make its preference for smoke-free areas known....A second reason for the discrepant views may lie in the failure of restaurateurs to actively seek customer preferences."

"Two factors were found to predict the provision of smoke-free areas in restaurants. First, owners perceiving a higher level of customer demand were more likely to provide areas to meet that demand....Second, owners who believed that restaurants 'should' provide such areas were more likely to provide separate areas."

"Smokers were likely to want the freedom to smoke anywhere and were less likely than nonsmokers to support separate areas or total smoking bans....The data presented suggest that restaurants have more to gain than to lose from the introduction of a smoking ban."

"A major perceived barrier to the provision of smoke-free areas was lack of space to provide effectively separate areas. However, given that nearly 50% of customers favored a total smoking ban in restaurants and only 15% said that a total ban would cause them to go to their favorite restaurant less frequently, it would seem

that a total ban is a more viable option for small restaurants than has previously been thought. Furthermore, a total smoking ban is the only effective strategy for protecting nonsmoking customers and staff from environmental tobacco smoke in small restaurants."

"One method of encouraging restaurants to provide smoke-free areas is to increase the level of active demand by customers."

"A legislative approach would address some of the important barriers to provision of smoke-free areas, such as the fear of loss of business."

"The growing threat of court actions by employees exposed to passive smoking provides a further incentive for restaurateurs to consider a total smoking ban."

"The argument against regulated provision of smoke-free areas in restaurants has been based on emotional appeals rather than on accurate data about the needs and preferences of customers."

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## STATISTICS AND RISK ASSESSMENT

[50] "Data Torturing," J.L. Mills, *New England Journal of Medicine* 329(16): 1196-1199, 1993

"If you torture your data long enough, they will tell you whatever you want to hear' has become a popular observation in our office. In plain English, this means that study data, if manipulated in enough different ways, can be made to prove whatever the investigator wants to prove. Unfortunately, this is generally true. Because every investigator wants to present results in the most exciting way, we all look for the most dramatic, positive findings in our data. When this process goes beyond reasonable interpretation of the facts, it becomes data torturing. The unfortunate result of torturing data is the dissemination of incorrect information to the research community and to patients."

"To understand how opportunistic data torturing works, it is necessary to understand the assumptions that underlie significance testing. In simple terms, significance tests are used to determine whether observed differences between groups, such as medically and surgically treated patients, are greater than one

would expect to occur by chance....For fairly arbitrary reasons, we usually say that a result is not due to chance if the P value is less than 0.05....[T]here is a 95 percent probability that we will correctly conclude that there is no difference when no difference is present. But when many independent tests are performed, that 95 percent probability of a correct conclusion drops drastically. For example, by simple probability calculations Statistics and Risk Assessment it can be shown that for two tests the probability that the 'significant' differences found by the investigators will reflect true differences is 90 percent ( $0.95 \times 0.95$ ). For 20 tests, it is only 36 percent. Thus, the data torturer can find significant results when none exist simply by making multiple comparisons."

"It must be a great comfort to practitioners of this technique to know that 1 of every 20 independent comparisons they make will yield a 'significant' result ( $P < 0.05$ ) if – and this is critical – they ignore the need to adjust for multiple comparisons. When this type of data torturing is done well, it may be impossible for readers to tell that the positive association did not spring from an a priori hypothesis."

"Procrustean data torturing, or manipulating the data so that they prove the desired hypothesis, requires selective reporting. It can take several forms. First, exposure may be redefined in a way that strengthens the association....Second, study subjects whose experiences do not support the hypothesis may be dropped....Third, disease outcomes may be lumped together, split, or dropped altogether to produce the desired results....Finally, normal ranges for laboratory results may be altered (although this must be done with care when common tests are reported). Of course, all these methods of selective reporting require the suppression of contradictory data."

"Procrustean data torturing is more difficult to carry out than opportunistic data torturing, but its results are often more believable if one starts with a popular hypothesis. It is also more destructive, because it may produce results that are seen as definitive proof of the hypothesis, whereas opportunistic data torturing is often viewed as only hypothesis generation."

"Data torturing can rarely be proved. There are, however, clues that should arouse the reader's suspicion."

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"In the case of opportunistic data torturing (the search for chance associations), the reader must ask, Is this a chance finding with an a posteriori hypothesis concocted to give it credibility, or is this an honest hypothesis-generating study? ...Hypothesis-generating studies (sometimes referred to somewhat contemptuously as 'fishing expeditions') should be identified as such. To warrant further exploration, findings from such studies should be biologically plausible. If the fishing expedition catches a boot, the fishermen should throw it back, not claim that they were fishing for boots."

"Similarly, an honest exploratory study should indicate how many comparisons were made. Although there is disagreement about how (or even whether) to adjust for multiple comparisons, most experts agree that large numbers of comparisons will produce apparently statistically significant findings that are actually due to chance."

"I will just say a few words about the misuse of P values and confidence intervals. P values give the reader a sense of how likely an observations is to be due to chance, but they can be abused by investigators who make multiple comparisons without adjusting the standard for significance. Confidence intervals offer more information. Technically, a 95 percent confidence interval tells the reader that if the same study were done 100 times, with subjects from the same population pool, 95 of the 100 confidence intervals would contain the true relative risk. Confidence intervals are thus valuable indicators of the precision of an estimate and the likely values of a measure within the population; a 95 percent confidence interval of 3.2 to 6.5 for a relative risk clearly defines an increased risk. A 95 percent confidence interval extending from 0.9 to 6.5 suggests a positive effect, but it is still within the realm of chance findings because the P value is greater than 0.05. Certainly, a confidence interval extending from 0.2 to 11.6 is merely an imprecise estimate. Yet such a confidence interval is sometimes used as evidence for high relative risk because the lower limit of an imprecise estimate can only approach zero, whereas the upper limit can increase without bounds."

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## APPENDIX B

### UPCOMING SCIENTIFIC MEETINGS

- **December 5-8, 1993**  
Annual Meeting, Society for Risk Analysis, Savannah, Georgia [In This Issue]
- **December 9, 1993**  
Liability, Compliance, Insurance and Indoor Air Quality, MidAtlantic Environmental Hygiene Resource Center, Philadelphia, Pennsylvania [In This Issue]
- **December 10, 1993**  
One Day Overview of Indoor Air Quality, MidAtlantic Environmental Hygiene Resource Center, Philadelphia, Pennsylvania [In This Issue]
- **December 15, 1993**  
Indoor Air Quality: An Overview for People Who Need to Know, AIHHM, San Antonio, Texas [Issue 57, Item 35] Same program to be held March 4, 1994, Orlando, Florida; April 13, 1994, Minneapolis, Minnesota; May 5, 1994, Chicago, Illinois; June 17, 1994, Oklahoma City, Oklahoma; July 14, 1994, Anchorage, Alaska
- **December 16-17, 1993**  
The National Environmental Tobacco Smoke Conference: Public Battles, Private Choices, IAQ Publications, Washington, D.C. [Issue 55, Item 34]
- **March 28-31, 1994**  
Eleventh ORNL Life Sciences Symposium, Indoor Air and Human Health Revisited (Bringing Selected Advances in Medical Science to the Indoor Air Quality Community), Knoxville, Tennessee [Issue 58, Item 43]
- **May 5-7, 1994**  
Second Annual IAQ Conference and Exposition, NCIAQ, Tampa, Florida [Issue 49, Item 35]
- **May 22, 1994**  
Indoor Air Quality Symposium, American Industrial Hygiene Conference and Exposition, Anaheim, California [Issue 57, Item 34]
- **October 10-14, 1994**  
9th World Conference on Tobacco and Health, Paris, France [In This Issue]
- **October 18-20, 1994**  
Indoor Air Quality in Asia, Beijing, China [Issue 54, Item 42]
- **October 30-November 2, 1994**  
IAQ '94: Engineering Indoor Environments, ASHRAE and other sponsors, St. Louis, Missouri [Issue 58, Item 42]

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